

Implementation of Geographic Information System (GIS) in Teaching Geography in Secondary Schools in Hong Local Government Area

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ABSTRACT

The purpose of the study was to determine the implementation of Geography Information System in teaching geography in senior secondary schools in HongLocal Government Area, Adamawa State. The study is a survey type by design: A sample of 120 teachers was used for the study drawn from 6 senior secondary schools using random sampling techniques. To achieve the purpose of the study, questionnaires was designed of twenty-one (21) questions, 20 close ended question while one open ended question was administered to the geography teachers and principals of the 6 various secondary schools. The data collected were subjected to statistical analysis used analysis of variance (ANOVA) at $P < 5\%$ (0.0000) level of significance. The result of the findings reveals that, there is significant integration and the old method of teaching geography in secondary schools. There is significant difference between the attitudes of geography teachers and implementation of Geography Information System in teaching Geography in secondary Schools. There is significant difference between gender and the use of Geography Information System facilities to support the teaching of geography in secondary schools. Based on these findings, it was recommended that teachers of geography should update their knowledge in Geography Information System. Government should provide GIS facilities in secondary schools to support the teaching of Geography teaching of Geography. Teachers should foster the implementation of Geography Information System in teaching geography in senior secondary schools in HongLocal Government Area, Adamawa State.

KEYWORDS: Geography, GIS, Implementation, Hong and Information

INTRODUCTION

The utilization of contemporary technologies in teaching contributes to the faster achievement of educational goals, which is why the GIS may be considered as a technique with the potential of facilitating problem-based learning (PBL) and inquiry-based learning (IBL) (Bednarz, 2014). Many studies examine the advantages of the GIS as a teaching aid in the context of interactivity in geography lessons (Johansson, 2016). The GIS directs the teaching process towards students; thus allowing them a higher level of acquisition of functional knowledge. It opens up a new approach to geographical education, i.e. students can use it during empirical and field research, in spatial analysis, as well as the visual representation, interpretation and presentation of research findings (Baker, 2012). However, notwithstanding its high didactic merits in geography lessons, the GIS is far from being widespread in teaching geography in schools worldwide. So far, comparing different cases, GIS application in teaching geography has been more as a result of the individual efforts of certain teachers or schools rather than a system- regulated standard in education (Hew and Brush, 2017). There are numerous obstacles and questions involved in the process of the implementation of the GIS in schools. Some of these issues are more characteristic of developing countries, while others are more prominent in developed ones (Van der Merwe and Mouton, 2015).

Geographic information system is a digital tool used mostly in an academic field, for collecting data, and representing the data in a form of maps or graphs. Geographic information system is relatively new used in the Nigerian society. With the recent trend on the geographic information system (GIS) at various levels of academic discipline, the researcher looking at its significance in the persuade of academic and Nigerian society, that geographic information system should be implemented in teaching and learning of geography at secondary schools level, where geography used to be perceived as “dry” subject as it makes little or no use of technology in teaching and learning geography (Yuda and Itoh, 2016).

The prospects of implementing geographic information system as a tool in teaching and learning of geography at secondary schools will improve the content knowledge and motivate students to learn geography as they interact with the computer and geographic information system (GIS) software, especially in the area of cartography, that is map design to digital map design via the use of geographic information system (GIS) as a tool in teaching and learning of geography (Keiper, 2009). According to Kerski, (2011) Geographic information system is significant in improving the teaching of geography, attitudes of both students and teachers of geography towards the use of geographic

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information system (GIS) technology in teaching and learning at secondary schools (Thomas and Steven, 2013).

The implementation of geographic information system in teaching geography at secondary schools will make the students to overcome mechanical aspects of the use of geographic information system, in map design, data-base analyses, and it will give the students opportunity to produce maps and analyzing geographical data. The geographic information system has the potentials to facilitate the use of problem based learning and inquiring based learning methods in the integration of geographic information system (GIS) into the classroom for teaching and learning geography, Wiegand, (2011) and Baker, (2013). Therefore, this study needs to conduct an investigation into the facilities and human resources that are available to implement geographic information system (GIS) in teaching and learning geography, with relevance to its use in secondary schools in Hong Local Government Area of Adamawa State.

Statement of the Problem

Geographic information system (GIS) is one of the major recent tool used in teaching Geography mostly at the high institutional academic level. It is a set of instruction or programme that involve the use of computer hardware which is Geographic Information system (GIS). In this recent years, there is a trend on the use of geography information system in the Adamawa State, looking at the importance of the programme to both academic and other organization in Nigerian society, has prompted the researcher to find the extent on the prospects of implementing Geographic Information System in teaching geography in secondary schools, in Hong Local Government Area of Adamawa State.

Purpose of the Study

The purpose of the study is to assess the effectiveness of Geographic Information System (GIS) on students academic achievement in teaching and learning Geography in secondary schools in Hong Local Government Area, Adamawa State. The specific objectives are to:

1. Determine the difference between the old method of teaching geography and the use of Geographic Information System (GIS) in teaching Geography in secondary schools.
2. Examine if there is differences between the attitudes of Geography teachers towards implementing Geographic Information System in teaching geography in secondary schools.
3. Ascertain whether there is difference between genders in the use of Geographic information System (GIS) facilities to support teaching geography in secondary schools.

Research Questions

The following research questions were formulated to guide the study.

1. What is the difference between the old method of teaching Geography and the use of Geographic Information System (GIS) in teaching geography in secondary schools?
2. What are the attitudes of Geography teachers toward implementing Geographic Information System (GIS) in teaching geography in secondary schools?
3. What are difference between genders in the use of Geographic information System (GIS) facilities to support teaching geography in secondary schools?

Research Hypothesis

The following research hypothesis will be tested for this study.

H₀₁: There is no significant differences between Geographic Information system (GIS) in integration and other method of teaching geography in secondary schools.

H₀₂: There is no significant differences between the attitudes of geography teachers and the implementation Geographic Information System (GIS) in teaching geography in secondary schools.

H₀₃: There is no significant differences between genders in the use of Geographic information System (GIS) facilities to support the teaching geography in secondary schools.

METHODS AND MATERIALS

Research Design

The research design adopted for this research work is the survey method. Both the strategy and the plan imply how the research objectives will be obtained and how the problem will be solved. The researcher used structured and unstructured questionnaire method to get information and it was administered to the respondents.

Population of the Study

Esan and Okafor in Oloyiwala, (2007) described population as the aggregate of all units in a target universe. It is also a group of interest to the researcher. Therefore, the population of this study consist of all the senior public secondary school teachers in Hong Local Government Area.

Sample and Sampling Techniques

While sampling is the process of selecting a number of individuals represent the larger group from which they were selected. Therefore, from the population of the study, a total sample of 120 senior public secondary school teachers made up of males and females was obtained. The teachers were selected from 6 schools out of the 15 senior public secondary schools and 20 teachers from each of the schools selected for the study. The random sampling technique was chosen because it gave every member of the population equal chance to be selected. It also ensures that the sample draw is a representative of the population from which it is drawn, so that the result can easily be generalized to the larger population and avoid bias.

Instrument for Data Collection

The instrument used for data collection for this study research work was the designed structured and unstructured of questionnaire. The instrument consist of (21) question, and is divided into two (2) sections. Section A, contain the respondents Bio data, such as gender, qualification, marital status and occupation. Section B, is the respondents option on the prospect of implementing geographic information system (GIS) in teaching and learning geography in secondary schools. In conducting this research, questionnaire was used to obtain data, twenty one (21) close-ended questions was used and also two (2) open-ended question was also used to gather data bases on respondent suggestion and advice. The likert type scale were used, the subjects are asked to respond to each item of given degrees of agreement or disagreement attitude statements were designed along the likert scale as seen below: (a) Strongly agree [SA], (b) agree [A], (c) disagree [D], (d) strongly disagree [SD], (e) undecided [UD]. The beginning of this questionnaire was made up of an introduction and at the same time request to the respondent.

Validity and Reliability of Instrument

Validity of an instrument used in collecting data is the extent to which instrument is accurately measured in a quantitative study. While reliability is the consistency to the accuracy of an instrument. A is the extent to which a research instrument consistently have the same result, is used in the same situation on repeated occasions (Bannigam, K., et al, 2009). The reliability of the instrument that contain twenty one (21) questions, was performed using Cronbach alpha. The coefficient obtained was 0.976 (9.76%) above the threshold of 0.70 (70%) as argued by Nually, (1978). The validity of the instrument was satisfied by the supervisor to ascertain the instrument face and content validity.

Method of Data Collection

The researcher collected the data personally after administering the questionnaire to the respondents, when they were through with filling of the items.

Method of Data Analysis

The returned questionnaire were checked by the researcher to ascertain proper filling. They were sorted out for easy analysis. The data obtained were calculated. The respondents' opinions were converted into frequencies and percentage, and analyzed by item. The researcher made use of statistical test, to test the data. These are frequencies were used to present information on data collected. The data was organized in table of percentage. The following statistical techniques was used i.e

$$\frac{\sum F}{N} \times \frac{100}{1}$$

Where 'F' represents the number of respondents to a particular item or variable.

While "N" represents the number of represents the number of respondents to a particular item or variable. The hypotheses was tested using ANOVA in order to ascertain the relevant differences. This test was done using Statistical Packages for Social Science (SPSS) 21.

RESULTS AND DISCUSSION

After analyzing the return copies of the administered questionnaire, the scores were interpreted to percentage (%) to enhance easy and meaningful analysis of the data. The hypothesis were tested using t-test in order to ascertain the radiant difference.

Table 1: Distribution of respondents as to whether Geographic Information System will promote studying of Geography

Responses	Frequency	Percent	Valid percent	Cumulative percent
Strongly disagreed	7	5.8	5.8	5.8
Disagreed	12	10.0	10.0	15.8
Undecided	10	8.3	8.3	24.2
Agreed	40	33.3	33.3	57.5
Strongly Agreed	51	42.5	42.5	100.0
Total	120	100.0	100.0	

From the above tables shows that 7(5.8%) of the respondents strongly disagreed with the above statement, 12(10.0%) of the respondents disagreed, while 10 (8.3%) of the respondents were undecided, 40(33.3) of the respondent were clearly agree with GIS will promote the study of geography, 51(42.5%) of the respondents were strongly agree of the statement above. This analysis shows that, majority of the respondents were of the motion that Geographic Information System will promote the study of Geography.

Table 2: Distribution of the respondents as to whether secondary schools does not have Geographic Information System (GIS) facilities for teaching Geography.

Responses	frequency	Percent	Valid percent	Cumulative percent
Strongly disagreed	4	3.3	3.3	3.3
Disagreed	5	4.2	4.2	7.5
Undecided	6	5.0	5.0	12.5
Agreed	56	46.7	46.7	59.2
Strongly Agreed	49	40.8	40.8	100.0
Total	120	100.0	100.0	

The table above shows that 4(3.3%) of the respondents strongly disagreed with the above statement, 5(4.2%) of the respondents disagreed with the statement, while 6(5.0%) of the respondents were undecided, 56(46.7%) agree with the statement as to whether secondary schools does not have Geographic Information System (GIS) facilities for teaching Geography, 49(40.8%) of the respondents were strongly agree with the above statement. From that analysis above indicate that majority agree that secondary schools does not have GIS facilities for teaching Geography.

Table 3: Distribution of the respondents as to whether secondary schools have human resources to implementing Geographic Information System (GIS) in teaching Geography

Responses	frequency	Percent	Valid percent	Cumulative percent
Strongly disagreed	10	8.3	8.3	8.3
Disagreed	13	10.8	10.8	19.1
Undecided	15	12.5	12.5	31.6
Agreed	44	36.7	36.7	68.3
Strongly Agreed	38	31.7	31.7	100.0
Total	120	100.0	100.0	

Table 3 above shows that 10(8.3%) of the respondents strongly disagreed with the above statement, 13(10.8%) of the respondents disagreed with the statement of whether secondary schools have human resources to implements Geographic Information System (GIS) in teaching Geography, 15(12.5%) of the respondents were undecided to the above statement, while 44(36.7%) of the respondents agree with the above statement, 38(31.7%) of the respondents strongly agreed with the statement. This analysis indicate from the table above that, majority believe that secondary schools have human resources to implement GIS in teaching Geography in secondary schools.

Table 4: Distribution of the respondent's suggestion as to whether geographic Information System should be implemented in secondary schools

Responses	Frequency	Percent	Valid percent	Cumulative percent
Supported (positive)	107	0.90	0.90	0.90
Not supported (negative)	13	0.10	0.10	100
Total	120	100.0	100.0	

Table 4 above shows the respondents suggestion as to implementation of Geographic Information System in teaching Geography in secondary schools. 107(0.90%) of the respondents support the implementation of Geographic Information System (GIS) in teaching Geography in secondary schools, while 13(0.10%) of the respondents did not support the idea of the implementing of Geographic Information System in teaching Geography ins secondary schools, the distribution above shows that, majority agreed with the idea. This analysis therefore, indicate that Geographic Information System should be implemented in teaching of geographic in secondary schools. According to the responses gathered on question (21) the opened ended statement, the respondents gave some advice to schools authorities.

From the recommendation made by most of the respondents, the following had been dawn: school authorities should provide and install Geographic Information System facilities, such as GIS laboratory, computer hardware and software, Generator for constant power supply etc. Schools authorities should send teachers of Geography to update their knowledge in Geographic Information System. Government should enhance the implementations of Geographic Information System in secondary schools as to support the programme.

Therefore, teachers of Geography in secondary schools should do their best to see that they implement the Geographic Information System as a new set of tools use in teaching Geography.

Hypotheses Testing

H_0 : there is no significant difference between Geographic Information System (GIS) integration and the old method of teaching Geography in secondary schools.

Table 5: Summarized statistic of one-way ANOVA

Items	N	Mean	df	Mean square	F-statistics	Significant
New method	101	88.93	-	-	-	-
Old method	19	42.00	-	-	-	-
Between groups	-	-	1	35221.49	279.04	0.0000
Within groups	-	-	118	126.23	-	-

Source: Researcher's computation using SPSS, 21.

The summary of the one way ANOVA shows that the mean of the new method is 88.93 while the old method is 42.00 the analysis also shows that, the differences between the two groups is more than that of same group as specified by the mean square of 35221.49 and 12.23 respectively. The F-distribution statistic (279.038 and the corresponding probability is 0.0000. sicne, the $P < 5\%$, we reject the null and accept the alternative hypothesis, which states that there is a significant difference between GIS integration and the old method of teaching in secondary schools.

Table 6: Hypotheses Two

Items	N	Mean	df	Mean square	F-statistics	Significant
Positive	98	89.90	-	-	-	-
Negative	22	44.09	-	-	-	-
Between groups	-	-	1	37699.20	358.27	0.0000
Within groups	-	-	118	105.23	-	-

Source: Researcher's computation using SPSS, 21.

The result on the table above shows that, that mean of teachers with positive attitude toward GIS is 89.90 and 44.00 is for teachers 'with negative dispositions. The mean square of 37699.20 shows that, the differenced of 105.23. the F-statistic is 358.27, and the significant value is 0.0000 ($P < 5\%$) these results leads to the conclusion that we reject the null and accept the alternative hypothesis, where states that, there is significant difference between the attitude of Geography teachers and implantation of Geographic Information System in teaching Geography in secondary schools.

Table 7: Hypotheses Three

Items	N	Mean	df	Mean square	F-statistics	Significant
Male	79	94.19	-	-	-	-
Female	41	57.05	-	-	-	-
Between groups	-	-	1	37233.95	341.064	0.0000
Within groups	-	-	118	109.170	-	-

Source: Researcher's computation using SPSS, 21.

The analysis on the table above shows that male have the highest mean of 94.19 and their counterpart have 57.05. The sum of square between the groups (37237.95) is less than that of the within, the group mean (109.170).the F-statistics is 342.064 and the significant value is 0.0000($P < 5\%$). Based on the value of the probability, it is also logical to conclude that we reject the null hypothesis, and accept the alternative, which states that there is a significant differences between genders in the use of Geographic Information System (GIS) to support the teaching of geography in secondary schools.

Findings

In the course of this research work, the researcher was able to come out with the following findings:

1. That the contents of Geographic Information System has a great influence on Geography.
2. The result also shows that some Geography teachers has negative attitude towards implementing Geographic Information System. Thus encourage their colleagues not to implement.
3. The result of the findings also shown that, teachers of Geography should use the opportunity to support the implementation of Geographic Information System in teaching Geography in secondary schools.
4. The research also shown that, there is a relationship between Geographic Information System (GIS) and Geography, because they complement each other, Geographic Information System and Geography.

Conclusion

The important of Geographic Information System (GIS) in teaching geography in secondary school in Hong cannot be over emphasized. A thorough examination of these has revealed that Geographic Information System and geography are related and both are necessary to complement each other for the studying of geography. However, in Hon Local Government Area, the role Geographic Information System could lay in the teaching of geography in secondary schools

is limited by Geography Information System, human resources, in the aspect of GIS and Government support toward the implementation of Geography Information System (GIS) in secondary schools. But in spite of these limitations, the geographic teachers in secondary schools are willing to implement the GIS in the teaching of geography whenever the facilities are available in secondary schools.

Recommendations

Based on the result of findings of this study, the following recommendations are made:

1. Geography teachers' in secondary schools should try to update their knowledge in Geographic Information System (GIS) to enable them to implement it in their teaching of geography.
2. Government and the schools authorities should support the implementation of Geography Information System the provision of GIS facilities in secondary schools such as computer hardware and software.
3. Geography Information System (GIS) laboratory should be built in each senior secondary school so that GIS facilities should be install.
4. Teachers of geography should faster the implementation of Geographic Information System in their lesson of geography whenever the facilities are made available in secondary schools.